REPLACEMENT CLAIMS

1. (cancelled) A method for debugging of analog and mixed-signal behavioral models in simulation, said method comprising the steps of:

performing a regular iterative equation solution process; and

performing a replay of the last iteration of an accepted timepoint;

wherein a user only gets to interact with the simulation during said iteration replay.

2. (cancelled) A method for debugging of analog and mixed-signal behavioral models in simulation, said method comprising the steps of:

performing a standard transient analysis algorithm, wherein Newton-Raphson iteration is generally followed; and

performing a replay of the last Newton-Raphson iteration of an accepted timepoint;

wherein a user is allowed to interact with the simulation during said replay only.

3. (currently amended) The method of Claim ~~2~~ 28, wherein the user may interactively debug a behavioral model by single stepping through the simulation.

4. (currently amended) The method of Claim ~~2~~ 28, wherein the user may interactively debug a behavioral model when a statement breakpoint is triggered in the simulation.

5. (currently amended) The method of Claim ~~2~~ 28, wherein the user may interactively debug a behavioral model when an object value change breakpoint is triggered in the simulation.

6. (currently amended) The method of Claim ~~2~~ 28, wherein the user may interactively debug a behavioral model when a write access breakpoint is triggered in the simulation.

7. (currently amended) A method for debugging of signal behavioral models, comprising the steps of:

(1) setting a trial time to start a transient analysis algorithm;

(2) initializing Newton-Raphson iteration;

(3) linearizing about the previous iteration;

(4) choosing a model instance;

(5) choosing a sequential statement;

(6) executing said sequential statement;

(7) testing whether said sequential statement is the last statement;

(8) switching to a next statement and going to step (6) if the result of step (7) is false;

(9) adding contributions to matrix A and vector b of a matrix equation Ax=b if the result of step (7) is true;

(10) testing whether said model is the last model;

(11) switching to a next model and going to step (5) if the result of step (10) is false;

(12) solving said matrix equation Ax=b if the result of step (10) is true;

(13) testing whether the solution of said matrix equation Ax=b converges;

(14) moving to a next iteration and going to step (3) if the result of step (13) is false;

(15) testing whether the trial timepoint is acceptable if the result of step (13) is true;

(16) rejecting said trial timepoint, choosing an alternate timepoint, and moving to step (2) if the result of step (15) is false;

(17) testing whether debugging is needed if the trial timepoint is accepted at step (15);

(18) testing whether said alternate timepoint is the last time point if the result of step (17) is false;

(19) moving to a next timepoint and moving to step (2) if the result of step (18) is false; and

(20) finishing said algorithm if the result of step (18) is true; and

wherein the last Newton-Raphson iteration of said accepted timepoint is replayed if the result of step (17) is true; and

wherein said replay of the last Newton-Raphson iteration comprises the steps of:

(21) choosing model instance;

(22) choosing sequential statement;

(23) testing whether the user is debugging by single stepping through the simulation or a statement breakpoint is encountered at said sequential statement;

(24) going interactive and then moving to step (25) if the result of step (23) is true;

(25) executing said sequential statement if the result of step (23) is false or preceded by step (24);

(26) testing whether a value change breakpoint or a write access breakpoint has occurred on an object of interest to the user;

(27) going interactive and then moving to step (28) if the result of step (26) is true;

(28) testing whether said sequential statement is the last statement if the result of step (26) is false or preceded by step (27);

(29) moving to a next statement and moving to step (23) if the result of step (28) is false;

(30) testing whether said model is the last model;

(31) moving to a next model and moving to step (22) if the result of step (30) is false;

(32) moving to step (18) if the result of step (30) is true.

8. (original) The method of Claim 7 is implemented on a simulator for solving systems of non-linear equations which can be represented by behavioral models.

9. (original) The method of Claim 7 is implemented on an analog circuit simulator.

10. (original) The method of Claim 7 is implemented on a mixed-signal simulator which comprises at least one digital simulation engine and at least one analog simulation engine.

11. (original) The method of Claim 7 is implemented on a partitioned and multi-rated analog circuit simulator.

12. (original) The method of Claim 7 is implemented on a mixed-signal simulator which comprises at least one digital simulation engine and at least one partitioned and multi-rated analog simulation engine.

13. (cancelled) A computer usable medium containing instructions in computer readable form for carrying out a process for debugging of signal behavioral models in simulation, wherein said process comprises the steps of:

performing a regular iterative equation solution process; and

performing a replay of the last iteration of an accepted timepoint;

wherein a user only gets to interact with the simulation during said iteration replay.

14. (cancelled) A computer usable medium containing instructions in computer readable form for carrying out a process for debugging of analog and mixed-signal behavioral models in simulation, wherein said process comprises the steps of:

performing a standard transient analysis algorithm, wherein Newton-Raphson iteration is generally followed; and

performing a replay of the last Newton-Raphson iteration of an accepted timepoint;

wherein a user is allowed to interact with the simulation during said replay only.

15. (currently amended) The computer usable medium of Claim ~~14~~ 30, wherein the user may interactively debug a behavioral model by single stepping through the simulation.

16. (currently amended) The computer usable medium of Claim ~~14~~ 30, wherein the user may interactively debug a behavioral model when a statement breakpoint is triggered in the simulation.

17. (currently amended) The computer usable medium of Claim ~~14~~ 30, wherein the user may interactively debug a behavioral model when an object value change breakpoint is triggered in the simulation.

18. (currently amended) The computer usable medium of Claim ~~14~~ 30, wherein the user may interactively debug a behavioral model when a write access breakpoint is triggered in the simulation.

19. (currently amended) The computer usable medium of Claim ~~14~~ 30, wherein said instructions in a computer readable form may be downloaded from a website over the Internet.

20. (currently amended) A computer usable medium containing instructions in computer readable form for carrying out a process for debugging of signal behavioral models, wherein said process comprises the steps of:

(1) setting a trial time to start a transient analysis algorithm;

(2) initializing Newton-Raphson iteration;

(3) linearizing about the previous iteration;

(4) choosing a model instance;

(5) choosing a sequential statement;

(6) executing said sequential statement;

(7) testing whether said sequential statement is the last statement;

(8) switching to a next statement and going to step (6) if the result of step (7) is false;

(9) adding contributions to matrix A and vector b of a matrix equation Ax=b if the result of step (7) is true;

(10) testing whether said model is the last model;

(11) switching to a next model and going to step (5) if the result of step (10) is false;

(12) solving said matrix equation Ax=b if the result of step (10) is true;

(13) testing whether the solution of said matrix equation Ax=b converges;

(14) moving to a next iteration and going to step (3) if the result of step (13) is false;

(15) testing whether the trial timepoint is acceptable if the result of step (13) is true;

(16) rejecting said trial timepoint, choosing an alternate timepoint, and moving to step (2) if the result of step (15) is false;

(17) testing whether debugging is needed if the trial timepoint is accepted at step (15);

(18) testing whether said alternate timepoint is the last time point if the result of step (17) is false;

(19) moving to a next timepoint and moving to step (2) if the result of step (18) is false; and

(20) finishing said algorithm if the result of step (18) is true; and

wherein the last Newton-Raphson iteration of said accepted timepoint is replayed if the result of step (17) is true; and

wherein said replay of the last Newton-Raphson iteration comprises the steps of:

(21) choosing model instance;

(22) choosing sequential statement;

(23) testing whether the user is debugging by single stepping through the simulation or a statement breakpoint is encountered at said sequential statement;

(24) going interactive and then moving to step (25) if the result of step (23) is true;

(25) executing said sequential statement if the result of step (23) is false or preceded by step (24);

(26) testing whether a value change breakpoint or a write access breakpoint has occurred on an object of interest to the user;

(27) going interactive and then moving to step (28) if the result of step (26) is true;

(28) testing whether said sequential statement is the last statement if the result of step (26) is false or preceded by step (27);

(29) moving to a next statement and moving to step (23) if the result of step (28) is false;

(30) testing whether said model is the last model;

(31) moving to a next model and moving to step (22) if the result of step (30) is false;

(32) moving to step (18) if the result of step (30) is true.

21. (original) The computer usable medium of Claim 20, wherein said process is implemented on a simulator for solving systems of non-linear equations which can be represented by behavioral models.

22. (original) The computer usable medium of Claim 20, wherein said process is implemented on an analog circuit simulator.

23. (original) The computer usable medium of Claim 20, wherein said process is implemented on a mixed-signal simulator which comprises at least one digital simulation engine and at least one analog simulation engine.

24. (original) The computer usable medium of Claim 20, wherein said process is implemented on a partitioned and multi-rated analog circuit simulator.

25. (original) The computer usable medium of Claim 20, wherein said process is implemented on a mixed-signal simulator which comprises at least one digital simulation engine and at least one partitioned and multi-rated analog simulation engine.

26. (original) The computer usable medium of Claim 20, wherein said instructions in a computer readable form may be downloaded from a website over the Internet.

27. (new) A method for linear debugging analog and mixed signal behaviorial matters of circuit designs, said method comprising the steps of:

extending a simulator based on a transient analysis, time advancement algorithm coupled with a non ordinary differential equation iterative solver;

performing interactive model behavior verification in which said transient analysis and iterative solver algorithms are used to derive acceptable timepoints; and

enabling single step execution and debug breakpoints via interactive replay of a last iteration of said iterative solver said breakpoints

performing an interactive model behavior verification in which said transient analysis and iterative solver algorithms to derive acceptable timepoints; and

enabling single step execution and debug breakpoints via interactive replay of a last iteration of said Newton-Raphson iteration solver at said breakpoints.

28. (new) A method for debugging analog and mixed signal behavioral models of circuit designs, said method comprising the steps of:

extending a simulator based on a transient analysis, time advancement algorithm, coupled with a Newton-Raphson non-linear ordinary differential equation iterative solver;

performing an interactive model behavior verification in which said transient analysis and iterative solver algorithms to derive acceptable timepoints; and

enabling single step execution and debug breakpoints via interactive replay of a last iteration of said Newton-Raphson iteration solver at said breakpoints.

29. (new) A computer usable medium containing instructions in computer readable form for carrying out a method for linear debugging analog and mixed signal behaviorial matters of circuit designs, said method comprising the steps of:

extending a simulator based on a transient analysis, time advancement algorithm coupled with a non ordinary differential equation iterative solver;

performing interactive model behavior verification in which said transient analysis and iterative solver algorithms are used to derive acceptable timepoints; and

enabling single step execution and debug breakpoints via interactive replay of a last iteration of said iterative solver said breakpoints

performing an interactive model behavior verification in which said transient analysis and iterative solver algorithms to derive acceptable timepoints; and

enabling single step execution and debug breakpoints via interactive replay of a last iteration of said Newton-Raphson iteration solver at said breakpoints.

30. (new) A computer usable medium containing instructions in computer readable form for carrying out a method for debugging analog and mixed signal behavioral models of circuit designs, said method comprising the steps of:

extending a simulator based on a transient analysis, time advancement algorithm, coupled with a Newton-Raphson non-linear ordinary differential equation iterative solver;

performing an interactive model behavior verification in which said transient analysis and iterative solver algorithms to derive acceptable timepoints; and

enabling single step execution and debug breakpoints via interactive replay of a last iteration of said Newton-Raphson iteration solver at said breakpoints.